

Ecological validity and the real-life/laboratory controversy in memory research: A
critical (and historical) review

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Abstract

This paper examines the nature and the origins of almost twenty years of controversy between ecological (i.e., real-life) and traditional (i.e., laboratory) approaches to memory research and critically analyses the concept of ecological validity - a core issue in this controversy which has received surprisingly little attention. The analysis of ecological validity suggests that it is comprised of two closely related aspects: representativeness and generalizability. While both aspects contribute to the ecological validity of a particular study, generalizability may play a more important role. Therefore, it is argued that the differences between the concepts of ecological validity and external validity are very small, and the appropriateness of re-introducing the former into the literature in the 1970s is questioned. Finally, it is argued that although the controversy between traditional and ecological approaches in memory psychology was practically over by the end of 1980s, the debates persistently recurred throughout the 1990s. The reasons for this paradoxical situation are discussed.

Introduction

A marked change appears to have taken place in cognitive psychology over the past twenty five years - the emergence of a new trend towards ecological reform (Gibbs, 1979) or an ecological approach (Neisser, 1985a). Accordingly, the term 'ecological validity' has become popular among cognitive researchers, and has started to appear in undergraduate texts on cognitive psychology, research methods and statistics as well as some dictionaries of cognitive psychology (see, for example, Ashcraft, 1994; Coolican, 1992; Eysenck, 1990; Eysenck & Keane, 2000). The need for ecological validity in empirical and applied research, moreover, has been stressed in such diverse areas of psychology as, for instance, child development (Fabes, Martin, Hanish, & Updegraff, 2000), neuropsychology (Sbordone & Guilmette, 1999; Silver, 2000), judgement and decision making (Koehler, 1996), and cognitive ergonomics (Hoc, 2001).

Thus, it would seem that an ecological approach has been acknowledged as a particular way of studying cognitive processes and, by now, it appears to have comprised a considerable part of cognitive psychology (see Bahrack, 1989; Neisser, 1985a; Poon, Welke & Dudley, 1993; Sbordone & Long, 1996; Winograd, Fivush & Hirst, 1999). However, both its acceptance as a legitimate and theoretically profitable approach and agreement on a basic definition of its methods and aims have been surrounded by continuous controversy and disagreement, most notably in the psychology of memory - a primary focus of the present paper.

In essence, the controversy has revolved around the merits and drawbacks of ecological (i.e., real-life or naturalistic) versus traditional (i.e., laboratory) approaches to psychological research and refers to the "tension between the need for control and the need to preserve the essence of the phenomenon under investigation" (p. 104; Baddeley, 1989; see also Poon et al., 1993). Although this tension goes at least as far back as 1930s

(see below),¹ it reached its peak in the early 1990s (see *American Psychologist*, 1991), triggered by Neisser's (1978) oft-cited talk at the first International Conference on Practical Aspects of Memory, and continued to occupy the minds of influential psychologists in the field of memory research throughout the 1990s (see e.g., Davies & Logie, 1993b; Payne & Conrad, 1997; Puckett & Reese, 1993; see also *Behavioral and Brain Sciences*, 1996, pp. 167-228).

Although later debates on the topic have been less intense than earlier ones, with some researchers saying that the 'real-life/laboratory controversy' was basically over (see e.g., Bahrick, 1996b; Bruce, 1996; Herrmann & Gruneberg, 1993; Kvavilashvili & Ellis, 1996) others argued that it was still alive (Fisher, 1996; Newby & Ross, 1996; Puckett, Reese & Pollina, 1993; Wright, 1996; 1997) and should be even "sharpened and cultivated" (Koriat & Goldsmith, 1996a). Similarly, some researchers expressed the view that this controversy had been crucial for memory psychology by fostering interesting new insights and theoretical developments (see e.g., McNamara, 1996; Poon, 1993) whereas others argued that it had "partly stymied theoretical development in this area for more than a decade" (p. 200; Larsen, 1996; for similar views, see also Baker-Ward, Ornstein & Gordon, 1993; Winograd, 1993).

Despite such a polarity of viewpoints no new debates have taken place in memory psychology in the past five or six years. Perhaps this can be taken as a sign that the controversy is finally over and that it is now possible to reflect upon some important questions without the risk of incurring another round of debates. The following two questions appear to be particularly apposite and timely. First, if changes in memory psychology have occurred in the past twenty-five years - as seems to be the case - what forms have they taken and why did they take place? Second, if the search for ecological validity was a prime motivator in an ecological approach to memory research then we

need to ask what is meant by the use of the term 'ecological validity'? In this paper we attempt to provide an answer to these questions by (i) briefly reviewing the history and various stages of the real-life/laboratory controversy; (ii) critically evaluating the implications of Neisser's (1978) conference paper for this controversy on the one hand, and Banaji and Crowder's (1989) rebuttal, on the other; (iii) examining the concept of ecological validity and, finally (iv) summarising the current status of the above controversy and its usefulness, if any, in generating and guiding current as well as future research in memory.

Historical overview

The problem of ecological validity was implicitly or explicitly tackled every time psychologists expressed their dissatisfaction with the limitations and shortcomings of apparently sterile laboratory experiments that did not seem to enhance an understanding of the processes normally occurring in people's everyday lives. This dissatisfaction was expressed as long ago as 1930, by Dewey, and 1932, by Bartlett. In the following decade Brunswik (1947) introduced the term 'ecological validity'² to justify the opposition of representative design (i.e., ecological approach in current terminology) to systematic design (i.e., traditional approach). The contrast he proposed stimulated a lively debate on the relative merits of these two designs and was discussed at length during the Berkeley Conference for the Unity of Science (1955) by a number of psychologists (e.g. Brunswik, 1955; Hammond, 1954; Hilgard, 1955; Krech, 1955; Postman, 1955; see also Cronbach, 1957). Moreover, many of the arguments underlying Brunswik's contrast re-emerged during the 1960s in a debate on the relative benefits of a laboratory as opposed to a field approach in psychology (see, for example, Chapanis, 1967; McGuire, 1969; Willems & Raush, 1969). Barker, in particular, was an enthusiastic proponent of the virtues of a field or ecological approach (Barker, 1965, 1968; see also, Gump & Kounin, 1960; Willems, 1965).

The most recent and influential expression of the merits of an ecological approach to cognitive psychology - particularly research on memory - was Neisser's (1978) opening address at the first International Conference on Practical Aspects of Memory. It is useful to restate the three main challenges issued by Neisser to a traditional laboratory approach to memory research (cf. Bruce, 1985; Poon, 1993):

First, the traditional approach has resulted in remarkably few new discoveries, established principles or general theories (cf. Cohen, 1985; Zacks & Hasher, 1992). Even well-established laws - such as the superiority of meaningful (e.g., stories) over meaningless (e.g., word lists) material or the positive effects of increasing study time - identify causal determinants that are so trivial that they should be obvious even to kindergarten children.

Second, memory research has been so preoccupied with broad theoretical issues (e.g., mechanisms of forgetting) that it has neglected - to a large extent - other, practically relevant and important questions (e.g., the characteristics and causes of childhood amnesia, the forgetting of appointments, or individual differences in memory performance). Indeed, Neisser suggested that "If X is an interesting or socially significant aspect of memory, then psychologists have hardly ever studied X" (p.4).

Third, most experiments are conducted in laboratories - artificial settings that have little in common with subjects' natural everyday environments. These experiments, moreover, employ test materials that have few exact counterparts in everyday life (e.g., unrelated word lists or digits). It is unlikely, therefore, that we will be able to generalise the findings from these studies to real-life situations. In Neisser's view such research lacks 'ecological validity'.

Neisser's (1978) conference paper is generally considered to be a seminal event in the development of everyday memory movement or ecological approach to memory research (Bruce, 1985; Cohen, 1989; Davies & Logie, 1993a; Gathercole & Collins, 1992; but see Hintzman, 1993 for an opposite viewpoint). Thus, in the years that followed Neisser's paper an increasing number of researchers began to tackle many of the topics outlined by Neisser, and others that appeared to have been neglected by traditional

laboratory research. Indeed, these changes in the foci of memory research compelled Neisser to revise (not unwillingly) his original statement; some ten years later, at the second International Conference on Practical Aspects of Memory he asserted that "If X is an interesting or socially important memory phenomenon, the chances are good - though not 100%, ... - that quite a few people are trying to study it" (p. 546, Neisser, 1988b).

What is even more important is that, by that time, Neisser's views on the traditional approach were also radically transformed. Thus, in 1988 he admitted that "since the mid-1970's, the laboratory-based study of remembering has undergone what amounts to a revolution of its own. Tulving's distinction between semantic and episodic memory, the postulation of "schemata" for everything from stories to selves, the research on scripts and event representation, the rush of new findings on memory development in children - all these are signs of renewed vigor and creativity in the field that I criticized so sharply a decade ago" (p. 2-3, Neisser, 1988a).

Unfortunately, Neisser's initial and profoundly negative evaluations of traditional experimental research were likely to irritate the proponents of traditional approach and to provoke an equally negative counter-reaction. While this can be seen in some negative reviews of subsequent everyday memory studies (see, for example, Mook, 1983; Potter, 1983), the most influential response to Neisser's challenge and the research that followed came from Banaji and Crowder (1989) in an equally influential paper entitled 'The bankruptcy of everyday memory' (see also Banaji & Crowder, 1991; 1994; Crowder, 1993). Since "rhetoric tends to stimulate counter-rhetoric" (p. 532, Baddeley, 1993) it is not perhaps surprising that Banaji and Crowder (1989) were as critical towards the ecological approach as Neisser (1978) was towards the traditional approach. Moreover, the charges they put up against the ecological approach were almost identical to those of Neisser against the traditional one. Thus, in their paper - which suffers from very selective sampling of everyday memory research (see Baddeley, 1993; Conway, 1991; Gruneberg, Morris & Sykes, 1991) - Banaji and Crowder (1989) dismiss the whole approach because, in their opinion, "no theories that have unprecedented explanatory

power have been produced; no new principles of memory have been discovered; and no methods of data collection have been developed that add sophistication or precision"(p.1185). Although the Banaji and Crowder (1989) paper attempted to characterise an ecological approach to memory as both useless and bankrupt, ironically, it produced an opposite effect. The swift and vehement counter-reactions evoked by this (intentionally) provocative paper (see *American Psychologist*, 1991; also Conway, 1993) clearly indicate that some irreversible changes did indeed occur in memory research during the 1980s and early 1990s.

Although the debate in the *American Psychologist* (1991) revealed a polarity in the community of memory researchers, with some participants defending Neisser (see e.g., Conway, 1991; Ceci & Bronfenbrenner, 1991) and others taking Banaji and Crowder's side (e.g., Roediger, 1991), it also showed that the majority of memory researchers, irrespective of their orientation (ecological or traditional) regarded these two approaches as complementary. Tulving (1991) went even so far as to say that the whole debate was useless and unnecessary. Thus, in his opinion "the debate about laboratory-based versus naturalistic study of memory is little more than a tempest in the teapot. In the long run, debates of this kind are irrelevant. The sound of the thumping of the chests and the sound of the epithets thrown from one side to the other will soon be forgotten. Once the participants' adrenaline level has returned to normal and they return to more productive pursuits, they will realize that the airing of the issue has run its standard course: a lot of heat and very little light generated, but many people happy because of the catharsis they experienced" (p. 42).

Unfortunately, Tulving's (1991) predictions were too optimistic. Subsequent events showed that participants' adrenaline levels did not return to normal and throughout the 1990s the controversy between ecological and traditional approaches was the subject of discussions in a number of conference presentations and proceedings (e.g., Bahrck, 1991a, 1996a; Kihlstrom, 1996; Winograd, 1991), book chapters (Baker-Ward, Ornstein & Gordon, 1993; Ceci, 1991; Conway, 1993; Crowder, 1993; Baddeley, 1993; Banaji & Crowder, 1994; Loftus & Ceci, 1991; Poon, 1993; Poon et al., 1993; Winograd, 1993;

Yuille & Wells, 1991) and journal papers (Herrmann & Gruneberg, 1993; Loftus, 1993a; Yuille, 1993). The most recent debate was triggered by Koriatic and Goldsmith's (1996a) target article in *Behavioral and Brain Sciences*.

The persistence of these debates about the nature and aims of an ecological approach in memory is surprising given that it was not only Neisser who seriously criticised traditional laboratory paradigms in the late 1970s and early 1980s (*cf.* Banaji & Crowder, 1989; Kihlstrom, 1996). In fact, very similar criticisms were expressed by many other researchers in such diverse areas of psychology as visual perception (Gibson, 1979; Haber, 1983), child development (Bronfenbrenner, 1974; Kuhn, 1978; McCall, 1977; Parke, 1976), clinical (Brooks & Baumeister, 1977; Gaylord-Ross, 1979), comparative (Miller, 1977), social (Argyris, 1975; McGuire, 1973), and environmental psychology (Proshansky, 1976), to name but a few. However, most of these criticisms failed to elicit serious debates, and when they did (see e.g., Haber, 1983) they could not be compared in intensity and persistence to the one observed in memory psychology. In order to understand the reasons for the development of this rather 'paradoxical' situation in memory psychology we need to evaluate the positions espoused by Neisser (1978) and Banaji and Crowder (1989) on the one hand, and analyse the concept of ecological validity, on the other.

Neisser (1978) versus Banaji and Crowder (1989)

It is interesting that Neisser's conference paper was almost immediately elevated to a classical status and cited extensively (see Morris & Conway, 1993). Although it has been invariably characterised as 'seminal' or 'landmark' it would be wrong to assume that it actually gave rise to the ecological approach to memory research (*cf.* Cohen, 1989). First, as mentioned above, Neisser was not the only researcher to criticize traditional approach in the 1970s. However, the popularity of his paper was probably partly due to the fact that Neisser, compared to others, boldly advocated the most extreme position by completely rejecting and dismissing one hundred years of laboratory research as useless, uninteresting and self-obvious.

Second, although Neisser complained that all genuinely interesting and important questions were avoided by memory psychologists his opening address was followed by several days of talks and discussions on such interesting and practically important topics as eyewitness memory, prospective memory, memory aids, brain damage, drugs and memory, to name but a few (see Baddeley, 1993). The fact that this was in contradiction with the main message of an opening address went largely unnoticed because, according to Baddeley (1993), "the tendency to move out of the memory laboratory was a relatively recent one, and in any case opening addresses are supposed to be rousing" (p. 532).

Therefore, one could assume that in 1978 Neisser expressed ideas (though, in exaggerated form) whose time had already come (see Baddeley, 1993; Cohen, 1989). Indeed, if it was not for this zeitgeist, first, it would have been impossible to convene a conference with almost one hundred presentations in the first place and, second, it would not have taken more than ten years to say something in defense of the traditional approach in memory research. Indeed, when Banaji and Crowder (1989) launched their attack on ecological approach the reaction to their paper was almost immediate.

One could argue that if Neisser's paper did not instigate the movement then, at least, it greatly fostered its further development. However, there are also other more trivial explanations for the rapid growth of everyday memory research in the 1980s. Thus, according to Davies and Logie (1993a) it was becoming increasingly difficult to get funds for basic research from Government Departments and private companies in many developed Western countries and therefore researchers had to turn to issues which had direct relevance to everyday problems in order to justify the funds requested (for similar views see also Baddeley, 1982; Baddeley & Wilkins, 1984; Fabes et al., 2000; Wright, 1997).

Therefore, the positive influence of Neisser's paper appears to be somewhat overestimated. Moreover, despite the initial euphoria that this paper might have aroused, unfortunately, it also gave rise to three major misconceptions about the aims and the character of an everyday memory approach for which many psychologists (including

Neisser himself) had to pay dearly both in terms of the time and energy spent on attempts to resolve the ostensible controversy between ecological and traditional approaches to memory research. These misconceptions can be summarised in the following claims: (i) an ecological approach to memory research advocates the abandonment of controlled laboratory research and supports only naturalistic observation, (ii) an ecological approach neglects or minimises the importance and necessity of theory development and hypothesis testing in memory research, and (iii) the primary aim of proponents of everyday memory research is to offer solutions to practically significant problems (i.e., it is essentially a branch of applied cognitive psychology).

Since Banaji and Crowder (1989) relied almost exclusively on Neisser's conference talk when writing up their rebuttal, their paper clearly suffers from all these misconceptions.³ Consider first Banaji and Crowder's central claim that everyday memory research (and Neisser) espouses the abandonment of laboratory work and its substitution by naturalistic observation. In their paper Neisser is compared to an apocryphal chemist who does not study the chemical properties of yeast in "tiresome laboratories with their unnatural test tubes, burners and finicky rules of measurement" but prefers instead to loiter in professional bakeries and to take careful notes.

Although Banaji and Crowder acknowledge that Neisser's more recent statement (Neisser, 1988a) is "...considerably less severe in its indictment of laboratory techniques.." (p. 1186), it is important to note that Neisser has never actually advocated the abandonment of laboratory methods. In fact, in several of his papers he has very clearly articulated the opposite view. This has been acknowledged even by Mook (1989) - a particularly ardent defender of laboratory experiments. For example, as early as 1976 Neisser argued that "cognitive psychologists must make a greater effort to understand cognition as it occurs in the ordinary environment and in the context of natural purposeful activity. This would not mean an end to laboratory experiments, but a commitment to the study of variables that are ecologically important rather than those that are easily manageable" (p.7, our italics). Some years later, he reinforced this assertion when he argued that "the most typical characteristic of the ecological approach is not an aversion

to the laboratory but an attempt to maintain the integrity of variables that matter in natural settings" (Neisser, 1985b, p.25).

Banaji and Crowder (1989) also appear to assume that everyday memory research minimises the contribution of theory and hypothesis testing and is primarily concerned with practical applications of observed findings. For example, they suggest that while everyday memory research can be characterised by " a preoccupation with natural settings and with the immediate applicability of research findings" the laboratory study of memory, in contrast, relies " on experimental techniques for theory testing and is concerned with the discovery of generalizable principles " (p. 1185). There is, however, little evidence to suggest that either Neisser or any other major contributor to everyday memory research holds such a view. Neisser (1978), for instance, has quite clearly stated that he is not "recommending the aimless accumulation of ecological minutiae" (p. 17). In his opinion the challenge for everyday memory researchers is " to shift from testing hypotheses for their own sake to using them as tools for the exploration of reality " (p. 17). With respect to practical applications Neisser (1985b) has stressed that " the ecological approach to cognitive science is a scientific undertaking ... Practical applications may result from it, but they are not its principal goal." (p. 27).

These points will be addressed more fully in the final section of this paper. At present, however, one conclusion that clearly emerges from the above discussion is that Banaji and Crowder (1989) launched, they believed, a devastating attack towards a position which no one actually held by the end of the 1980s, not even its major proponent. Indeed, rather than criticising the ecological approach per se as it existed at the end of 1980s, they attacked its non-existent stereotypic image. Unfortunately, the debates that almost immediately followed the publication of their paper failed to identify and emphasise this important point. Even more surprising is the fact that a number of everyday memory researchers, apparently offended by the tone of Banaji and Crowder's paper, rushed to defend this stereotypic image of ecological approach (e.g., see Conway, 1993).

In summary, one of the reasons for the recurring debates on real-life/laboratory controversy in memory psychology is that this controversy, although initially triggered by Neisser's conference paper, appears to be based on serious misconceptions and false accusations. Indeed, if one ignores Neisser's conference talk and concentrates instead on his earlier and, especially, subsequent work (e.g., Neisser, 1976; 1985a; 1985b; 1988a; 1988b; 1988c), then it is clear that there are no overriding differences between the Banaji and Crowder and Neisser's views (cf. Roediger, 1991) except that the latter does not regard the everyday movement as bankrupt (see Neisser, 1991).⁴ Indeed, the above discussion has made it clear that Neisser does not dispute Banaji and Crowder's key argument about the necessity of rigorous experimental control in one's research. Similarly, Banaji and Crowder (1989) seem to agree with Neisser about the importance of ecological validity in one's study when they suggest that "ecologically valid methods... used to produce generalizable results is the best situation in which to find oneself" (p. 1188).

Another important reason for the persistent nature of the real-life/laboratory controversy is perhaps the lack of attention devoted to an apparently central issue of the debate - the nature and characteristics of the concept of ecological validity itself. Given that there appears to be general agreement that an ecologically valid study is at least desirable, if not strictly necessary,⁵ examination of this concept seems essential for better understanding of the origins and the persistent nature of the everyday/laboratory controversy.

The concept of ecological validity

Although the concept of ecological validity has gained some popularity over the past twenty-five years, there have been remarkably few attempts to analyse it in any great detail (for some exceptions, see Ceci, 1991; Karuza & Zevon, 1985; Schmuckler, 2001; Yuille & Wells, 1991). In practice, many researchers, even the participants of the debates on real-life/laboratory controversy, use this term without providing a clear definition of its meaning. It is perhaps this lack of clarity about the nature of ecological validity that has made Winograd (1988) complain "how difficult it is in practice to be able to say

whether research of any kind, whether of naturalistic or laboratory origin, is ecologically valid" (p.17). Moreover, different authors seem to emphasize different aspects of this concept. Thus, some stress the importance of realistic materials and tasks (see Karuza & Zevon, 1985; Schmuckler, 2001) while others focus on the generalizability (Ceci, 1991) and/or applicability (Yuille & Wells, 1991) of the results.

In general, however, the concept of ecological validity appears to be comprised of two different, but closely related aspects which we call representativeness and generalizability. The first, representativeness, describes the extent to which a phenomenon can be investigated in a form and in a context that corresponds to its occurrence in everyday life. Generalizability, as the term suggests, refers to the degree to which the results of a particular study (or set of studies) are able to explain (other) similar processes or tasks in everyday life.

Despite an obvious similarity these two aspects of ecological validity are not identical. Representativeness appears to refer to the 'naturalness' or 'artificiality' of (i) an experimental situation and (ii) the experimental materials and/or task. Studies of nonsense syllables, for example, are usually regarded as unrepresentative since these essentially meaningless stimuli are also devoid of any clear reference to a meaningful object etc. in everyday life: they are (deliberately designed to be) 'artificial'. The experimental situation also - usually a conventional psychological laboratory - may be regarded as one that is unrepresentative of the situations that one normally encounters in everyday life (but see Baker-Ward et al., 1993; Coolican, 1990, for an alternative view). Generalizability, on the other hand, addresses the question of whether a particular law or relation operates only within the confines of the particular circumstances of the original study or whether it also holds under (other) similar circumstances in everyday life.

In practice, the classification of any one study in terms of its representativeness is a task fraught with difficulties. As Winograd (1988) has noted, for example, it is often quite difficult to "...draw a line where artificiality ends and ecological validity, or memory for real events begins" (p. 18) (see also Sinnott & West, 1992). In other words, we cannot always draw a clear distinction between 'artificial' and 'natural' materials or

tasks. In a similar vein, one cannot necessarily equate 'artificiality' (of a situation) with all laboratory experiments and 'naturalness' with everyday contexts. Some laboratory experiments, for example, appear to employ natural materials in a context that simulates a naturally-occurring situation (see, for examples, Gelfand, 1985; Neisser, 1985b). Conversely, some field studies (natural context) investigate tasks that appear to bear only a passing resemblance to naturally-occurring ones (see, for examples, Kvavilashvili, 1992).

We suggest, therefore that natural and artificial be regarded as end-points on a continuum and offer the following criteria for distinguishing between these end-points. For a study to be considered natural (i) it should have a task and materials that are both meaningful and plausible (to the subject) in the context of the particular situation in which performance on these is examined, and (ii) the basic components of the study should simulate aspects of the phenomenon under investigation which are consistent with its form and occurrence in an everyday context (*cf.* Karuza & Zevon, 1985; see also Tunnell, 1977 for more detailed discussion on the dimensions of representativeness).

If we consider the issue of generalizability then we see that comparable difficulties can arise. Neisser (1978), for example, questioned the generalizability of many laboratory findings - are these findings applicable to their real world correlates? Generalizability here, therefore, refers to the degree to which a particular law or set of relations, revealed by empirical investigation, operates in real life situations. Generalizability, however, can also be used to refer to the methodological soundness of a particular study. This interpretation clearly addresses a very important aspect of empirical research, one that is emphasized by Banaji and Crowder (1989; 1991). However, it does not include consideration of whether laboratory studies, in their usual form and content, address or are capable of addressing aspects of memory processing that are important in everyday activities. For clarity we use the term generalizability to refer to this latter interpretation only and describe the methodological soundness of a study in terms of its internal validity. Clearly, however, these two concepts are not unrelated. For example, while it is apparent that low internal validity may preclude or seriously

compromise generalizability (*cf.* Banaji & Crowder, 1994) it is also clear that high internal validity does not automatically guarantee it.

Under the present analysis, if a study is both generalizable and representative then it can be said to be ecologically valid. Conversely, if it lacks both of these features then it is not an ecologically valid study. The debate, therefore, centres on the relative importance of representativeness and generalizability for studies that possess only one of these features; what implications does this have for their ecological validity ?

Consider first, studies conducted on representative material which do not meet the criteria of scientific rigour and therefore have low internal validity. Clearly, even highly representative studies, such as those conducted in an everyday context with apparently natural materials (and/or tasks), may fail a generalizability test if they do not exert sufficient control over incidental factors. For example, in several naturalistic studies of prospective memory participants have been asked to remember to carry out simple tasks at pre-arranged times/dates (such as making a phone call or sending a post-card) in the course of their everyday lives (see Harris, 1984). However, the results of such studies can be compromised by the experimenter's inability to exert control over various unforeseen and confounding variables like, for instance, the use of external mnemonic aids or lack of motivation to carry out the task after it has been remembered. If a study has low internal validity this will necessarily affect its generalizability. We would, therefore, question the ecological validity of such research (*cf.* Dipboye & Flanagan, 1979; Weisz, 1978). As we noted earlier, one of the main reasons for adopting an ecological approach appears to have been the desire to ensure generalizability, through the use of representative materials or tasks. Representativeness of task/materials and situation alone, however, do not appear to be sufficient to support the claim that a particular study is ecologically valid if problems with the research design severely limit confidence in the robustness of its findings.

Consider next, a study conducted with artificial materials or tasks in the laboratory, with findings that are demonstrated to hold in a comparable real-world situation. Can such a study be regarded as ecologically valid? We suggest that it can.

Consider first the following principle established by Ebbinghaus (1885/1964): a previously learned but completely forgotten list of nonsense syllables requires fewer repetitions for re-learning. Precisely the same results were obtained by Nelson (1978) on the lists of unrelated words, and more importantly by Bahrick and Phelps (1988) on such highly representative material as the forgotten names of previously known celebrities. Although Neisser (1988a) called the results of the latter experiment ‘novel’ and ‘encouraging’, the authors themselves willingly admit that their data “confirm what Ebbinghaus (1885) established long ago: Savings in relearning do not depend on conscious recognition that material is familiar” (p. 187).

Another example refers to the superiority of distributed practice over massed practice (i.e., the so called spacing effect), established more than one hundred years ago by Jost (1897) on such artificial materials as nonsense syllables and digits. Thus, in one of his experiments the recall of a list of nonsense syllables was three times superior in the condition where the 24 repetitions were distributed across 12 days (two repetitions per day) in contrast to a condition where the same number of repetitions was spread over three days only (eight repetitions per day). Broadly similar results have been obtained for foreign vocabulary items in laboratory setting (e.g., Bloom & Shuell, 1981) and, more importantly, on educational material such as spelling lists and multiplication facts (Rea & Modigliani, 1985) or lectures on statistics (Smith & Rothkopf, 1984) in the classroom situation. Finally, the superiority of distributed practice was also established by Baddeley and Longman (1978) in the applied setting of a post office where the workers had to learn to type the postcodes.⁶

In retrospect, it appears that the results of the aforementioned experiments of Ebbinghaus and Jost were no less ecologically valid than those of subsequent studies conducted on highly representative materials and/or settings. Indeed, they appear to tell us about some of the principles that operate in people's everyday life as effectively as in the laboratory (*cf.* Hintzman, 1974; Pate, 1986).

Unfortunately, however, there are still relatively few examples of studies that fall into this fourth category (i.e., low representativeness but high generalisability). In part,

this may be the result of failure, by memory researchers, to try and replicate their laboratory findings in real-world situations and tasks. Internal validity, of itself, offers no guarantee for generalizability. The onus is clearly on researchers who undertake these studies to attempt this type of replication. It was both the relative paucity of such research strategies by the end of 1970s, together with expressed doubts that laboratory research would automatically generalise that led to the perceived need for ecological reform of these practices in the first place. We shall return to this point in the final section of the paper.

It is important to stress that the concept of ecological validity has often been considered with reference to only one of its aspects, namely, representativeness (*cf.* Petrinovich, 1989). For example, Banaji and Crowder (1989) seem to hold this view by opposing the 'ecological validity of methods' with the generalizability of results (Figure 1, p.1188). In contrast, we argue that ecological validity is comprised of both representativeness and generalizability. Moreover, given the general aims of everyday memory research, we suggest that generalizability is the more critical aspect of ecological validity (*cf.* Ceci, 1991). Generalizability, however, requires that a study have high internal validity. Thus, in practice, the ecological validity of a study conducted in the real world may be mediated by its internal validity. Moreover, when its internal validity is low it may be less ecologically valid than a well-controlled laboratory study conducted with artificial materials or tasks that can be demonstrated to result in generalizable findings (see Conway, 1996; Gruneberg & Morris, 1992). However, given the relative paucity of such studies, a higher degree of representativeness may yet turn out to be an important element in determining the generalizability of laboratory-based research (*cf.* Loftus & Ceci, 1991).

By defining ecological validity in the above manner we believe that it is possible to avoid the potential error of automatically classifying all research conducted in the real-world as ecologically valid and all traditional laboratory studies as ecologically invalid. In addition, we suggest that the onus is on both everyday memory and traditional memory researchers to demonstrate the generalizability of their research findings.

Finally, because the above discussion has stressed the importance of generalisability in determining ecological validity, it is also necessary to address the issue of external validity which, according to Campbell and Stanley (1963), refers to the extent to which one can replicate the results of a particular study with other experimental settings, task materials and subject populations. Some researchers prefer to speak about external rather than ecological validity not only because the latter has been used in different sense by Brunswik, its originator (see Footnote 2) but also because of an obvious similarity that exists between these two terms. Indeed, the only difference between the two terms seems to be in that, unlike external validity which is concerned with the issue of generalisability, ecological validity is additionally concerned with the issue of representativeness. However, since the above discussion has made it clear that generalisability may be the more important determinant of ecological validity then the difference between the two concepts is really small (see Ceci, 1991, for a similar conclusion) and, in some cases, non-existent. In view of this similarity one may question the appropriateness of introducing this term in the 1970s given that it caused so much confusion and has been a central construct of the recurring debates on real-life/laboratory controversy (*cf.* Hammond, 1998).

The relationship between the two approaches

By analysing the concept of ecological validity and reviewing some of the ideas espoused by the major proponents of real-life/laboratory controversy, we have tried to trace the origins of this controversy and understand the reasons that led to the series of debates in memory psychology throughout the 1990s. In this section we want to further clarify some of the points discussed earlier in order to evaluate (i) the relationship between ecological and traditional approaches to memory research, and (ii) the current status of the real-life/lab controversy together with its usefulness, if any, in generating and guiding the current as well as future research in memory psychology.

The relationship between ecological and traditional approaches is a complex issue, having many different facets and angles which make it very difficult to distinguish one from the other. Thus, despite almost two decades of heated discussions on the real-

life/laboratory controversy there is no clear agreement on what the controversy is about in the first place (see Koriat & Goldsmith, 1996 a,b). It is important to note, however, that the question about the relationship between the two approaches is closely related to the misconceptions about the aims and nature of everyday memory research that were discussed in previous sections.

According to one view, ecological and traditional approaches differ with respect to the type of the to-be-studied phenomena (see Bruce, 1996). For example, it is assumed that an ecological approach tackles genuinely interesting everyday phenomena such as flashbulb memories, face recognition and eye-witness testimony, metamemory, prospective memory, tip-of-the-tongue phenomenon etc. On the other hand, in order to study such topics as modality, serial order or recency effects the traditional approach deals mainly with lists of unrelated words or digits (see Conway, 1993; Bruce, 1996; Neisser, 1978). Although this distinction is frequently drawn it is one that is difficult to maintain. Face recognition, eyewitness testimony and the tip-of-the-tongue phenomenon, for example, were studied within the traditional approach long before the emergence of an ecological one. Similarly, serial order and recency effects (both short- and long-term) have been studied with representative material within an ecological approach.

According to another influential view, the ecological approach is characteristically oriented towards the solution of some concrete and practically important problems whereas the traditional approach deals mainly with the construction and test of abstract models of human behaviour (see e.g., Yuille & Wells, 1991). Thus, Cohen (1989) suggests that ecological and traditional approaches "are not two different ways of doing the same thing, one of which is better than the other. They are equally valid ways of doing two different, but equally important jobs." (p. 4). Mook (1989) also appears to advocate this view by arguing that the ecological approach aims to make predictions about the real world whereas the traditional approach aims to understand the basic mechanisms of cognition and therefore the issue of prediction is irrelevant.

However, Cohen's own review of everyday memory research clearly shows that the majority of everyday memory research is not directly concerned with practical

applications. While the tasks and materials that everyday memory researchers employ may be more immediately accessible to an applied psychologist, the theoretical concerns that they address may be as distant from an applied psychologist's immediate needs as those examined under a more traditional approach (cf. Bahrnick, 1991b, 1996a; Bruce, 1991; Conway, 1991; Herrmann & Gruneberg, 1993). Thus, a concern with variables and tasks that are important in the real-world should not be taken to imply either a disinterest in theory or an exclusively practical orientation (see Baddeley, 1982; 1989; Poon et al., 1993). One may conclude, therefore, that both approaches actually have the same basic aim of understanding and explaining the operation of memory processes expressed in human behaviors (see Bahrnick, 1996b; Gelfand, 1985; Herrmann & Gruneberg, 1993).

Furthermore, according to the most popular view, the difference between the two approaches is mainly methodological (cf. Puckett, Pollina, Laipple, Tunick & Jurden, 1993) in that the traditional approach uses controlled methods in laboratory whereas the ecological approach uses less rigorous methods in naturalistic settings (e.g., Banaji & Crowder, 1989; Hirst & Levine, 1985; Wright, 1996). It is interesting to note that the above view might have been partly correct in late 1970s when several memory researchers started to investigate memory outside the laboratory using a variety of less controlled methods. However, in subsequent years the shortcomings of experiments lacking internal validity became all too obvious and by the end of 1980s the majority of ecologically oriented psychologists tried to exert as much control in their research as possible.⁷ Recent meta-analyses of both traditionally and ecologically oriented studies on memory has revealed an interesting paradox: although many researchers advocate the necessity of using naturalistic methods, in reality most of the research in both camps is still conducted in the laboratory (see Poon et al., 1993; Puckett et al., 1993).

This is somewhat ironic given that the inception of the ecological movement in late 1970s was greatly encouraged by findings obtained outside the laboratory which did not replicate the results of some well established laboratory paradigms. This was perceived as a direct challenge to the implicit assumption of the traditional approach that the basic principles which govern human behaviour in the laboratory will necessarily

generalise to comparable situations in everyday life. The ecological approach therefore stressed the importance of context (variables in and the structure of one's natural environment) in shaping behaviour (Ceci, 1993; Ceci & Bronfenbrenner, 1991; Neisser, 1985b; Yuille, 1993; Yuille & Wells, 1991).

However, subsequent research has shown that the discrepancy between the laboratory and field studies can often be due to one's inability to take into account some confounding variables that are present in one context but not in the other rather than to some fundamental breach between the laboratory and real-life contexts (*cf.* Baker-Ward et al., 1993; Banaji & Crowder, 1994; Crowder, 1993; Klatzky, 1991). For example, Parrot and Sabini (1990) managed to obtain the mood-incongruency effect, initially revealed in a naturalistic context, in the laboratory but only when participants did not suspect that laboratory manipulations were aimed at creating certain moods in them (see Winograd, 1993).

Even more illuminating findings in this respect have been reported by Koriat and Goldsmith (1994; 1996a) in a series of experiments aimed at resolving the so called recall-recognition paradox, which refers to the superior performance of recall over recognition often observed in naturalistic studies (e.g., Lipton, 1977; Neisser, 1988b) and the superior recognition performance usually obtained in laboratory studies within a traditional list-learning paradigm (e.g., Brown, 1976; Mandler, Pearlstone, & Koopmans, 1969). Although this discrepancy can be perceived as illustrating the limitations of laboratory studies, since the contrasting results emerge from the two contexts of inquiry, Koriat and Goldsmith (1994) noticed that laboratory results were usually obtained on quantitative measures of memory performance (i.e., a total number or percentage of correctly recalled or recognised items) whereas naturalistic studies relied on accuracy measures (percentage of correctly recalled or recognised words out of the total number of items produced or identified). Therefore they argued that the discrepancy may not have been due to the context of inquiry *per se* (laboratory vs. naturalistic setting) but to the different measures used in the two contexts. Another confounding variable identified by these authors was that in recall tests participants can choose to manipulate their recall

output whereas in recognition tests they usually are forced to choose one response from a set of alternatives.

In an elegant series of laboratory experiments Koriat and Goldsmith (1994) not only managed to obtain the pattern of superior recall performance, previously observed in naturalistic studies, but were also able to show that this superiority was not due to the experimental setting but to the memory property (accuracy vs. quantity measures) and the report option (free vs. forced recall or recognition) used in a particular study. Koriat and Goldsmith (1994) therefore concluded that the results of their experiments illustrate “how at least some of the dynamics that emerge in ‘real life’ memory situations may be operationalized and studied fruitfully in the laboratory” (p. 306).⁸

Finally, with respect to the relationship between traditional and ecological approaches to memory, Koriat and Goldsmith (1996a) have suggested that the controversy between the two approaches goes deeper than the issues of ‘how’, ‘where’ and ‘what’ phenomena should be studied and relates to the differences in underlying metaphors, i.e., the differences in the way memory is perceived and evaluated (see also Neisser, 1996). Thus, according to Koriat & Goldsmith (1996a), the traditional approach has been dominated by a storehouse metaphor which is only interested in the quantity of memory input whereas the ecological approach has been guided by a correspondence metaphor which emphasises the accuracy of memory output. Although commentators on Koriat and Goldsmith’s (1996a) target article mostly agreed on the importance of storehouse/correspondence distinction for clarifying some interesting theoretical issues in memory research, they did not appear to be convinced that it helps to draw a clear line between traditional and ecological approaches (see e.g., Kruglanski, 1996; Kvavilashvili & Ellis, 1996). Indeed, even Koriat and Goldsmith (1996a) admit that a great deal of correspondence oriented research is conducted in the laboratory and much everyday memory research continues to use storehouse metaphor (see also Winograd, 1996).

In conclusion, therefore, one could say that although the real-life/laboratory controversy has been driven by an implicit assumption that there are some crucial differences between the ecological and traditional approaches, memory psychologists

have repeatedly failed over the last two decades to identify a clear set of variables that would distinguish them from each other. This paradoxical situation can only be accounted for by the divergence between what ecological approach was intended to be at the time of its inception and what it eventually developed into.

Neisser's (1978) talk undoubtedly contributed to the creation of a certain stereotypic image of what the ecological approach should look like. However, the ecological approach evolved into something different (cf. Herrmann & Gruneberg, 1993). As shown by the above discussion, in the long run it did not abandon controlled methods of investigation or an interest in theory testing and development while the laboratory is still a frequently used setting for everyday memory researchers. Finally, and most importantly, it has not evolved into a branch of applied cognitive psychology despite repeated attempts to identify everyday memory approach with applied research. Obviously, this makes it extremely difficult to distinguish an ecological approach from a traditional one which, by the way, has itself undergone great changes over the recent years (as acknowledged by Neisser himself) by gradually moving in the direction of the ecological one.⁹

Thus, contemporary research practices in memory appear to lie on a continuum; the end points only, of this continuum, correspond to the ecological and traditional approaches in their "pure" or stereotypic form. These end points are best represented by Neisser's (1978) conference talk and Banaji and Crowder's (1989) paper, respectively. However, most currently conducted research on memory tends to strive towards the middle section of this continuum, thereby indicating that the real-life/laboratory controversy has been resolved in favour of peaceful coexistence and mutual enrichment.

¹⁰ Most importantly, however, this major change in memory research occurred as early as the end of the 1980s (i.e., when the ecological approach firmly established itself or rather blended with a more traditionally oriented research). Therefore, it is rather unfortunate that Banaji and Crowder's (1989) paper managed to instigate a series of unnecessary debates and discussions throughout the 1990s. Since the real-life/laboratory controversy was basically over, it is obvious that these debates could not have guided or informed in

any useful way current practices in memory research (see Tulving, 1991). In their day to day work most psychologists (irrespective their orientation) are now primarily concerned with the issues of relevance, feasibility, methodological rigour and conceptual soundness of a study that has been undertaken. While issues related to the real-life/laboratory controversy may also arise they are unlikely to be a prime motivator of any particular study.

Mandler (2003), in his recent essay on the history of psychology, has noted that “what has happened before [in psychology] often tends to happen again - in a somewhat different form. The impression is of some kind of Hegelian spiral with efforts returning periodically to similar themes and approaches though at a different (higher?) level” (p. 1). In our opinion, the history of the real-life/laboratory controversy nicely illustrates this cyclic nature of scientific endeavour. For example, debates on ecological validity and related issues emerged several times throughout the 20th century, starting from the 1940s (*cf.* Schmuckler, 2001). The most recent and the prolonged series of debates in memory psychology started in the end of 1970s and, due to particular circumstances discussed in this paper, lasted for almost two decades. Furthermore, at the end of the 1970s the ecological movement started off by rejecting a basic assumption of the traditional approach which stated that certain principles established in laboratory could operate in other contexts as well. It is interesting, that after two decades of intensive research in both camps, most psychologists have arrived at the conclusion that broadly similar mechanisms may be at operation both inside and outside laboratory (see Bjork & Wickens, 1996; Poon et al., 1993; Puckett et al., 1993; Winograd, 1993). These conclusions, however, are much more informed and robust than they were in 1970s as they are based on a growing body of research accumulated over almost two decades of research.

Finally, Mandler (2003) has also complained about the lack of historical memory in psychology where “phenomena and explanatory systems are rediscovered without the scientific community displaying any awareness of their previous appearance” (p. 1). It is our hope that the lessons we have learned from the latest rounds of real-life/laboratory controversy are important and memorable enough to prevent psychologists in the 21

century from “rediscovering” the concept of ecological validity and eliciting further debates on real-life/laboratory controversy.

References

- Argyris, C. (1975). Dangers in applying results from experimental social psychology. American Psychologist, 30, 469-485.
- Ashcraft, M. H. (1994). Human memory and cognition (2nd ed.). New York: Harper Collins.
- Baddeley, A. D. (1982). Domains of recollection. Psychological Review, 89, 708-729.
- Baddeley, A. (1989). Finding the bloody horse. In L. W. Poon, D. C. Rubin & B. A. Wilson (Eds.), Everyday cognition in adulthood and late life (pp. 104-115). New York: Cambridge Univ. Press.
- Baddeley, A. (1993). Holy war or wholly unnecessary? Some thoughts on the ‘conflict’ between laboratory studies and everyday memory. In G. M. Davies & R. H. Logie (Eds.), Memory in everyday life (pp. 532-536). North-Holland: Elsevier Science Publishers.
- Baddeley, A. D. & Hitch, G. (1977). Recency re-examined. In S. Dornic (Ed.), Attention and Performance (vol. 6, pp. 647-667), Hillsdale, NJ: L.E.A.
- Baddeley, A. D. & Longman, D. J. A. (1978). The influence of length and frequency on training sessions on the rate of learning type. Ergonomics, 21, 627-635.
- Baddeley, A. D. & Wilkins, A. (1984). Taking memory out of the laboratory. In J. E. Harris & P. E. Morris (Eds.), Everyday memory, actions and absent-mindedness. London: Academic Press.
- Bahrack, H. P. (1989). The laboratory and ecology: Supplementary sources of data for memory research. In L. W. Poon, D. Rubin & B. A. Wilson (Eds.), Everyday Cognition in Adulthood and Late Life (pp. 73-83). New York: Cambridge University Press.
- Bahrack, H. P. (1991a). Appropriate strategies for memory research. Paper presented at the International Conference on Memory, Lancaster, July.

Bahrick, H. P. (1991b). A speedy recovery from bankruptcy for ecological memory research. American Psychologist, 46, 76.

Bahrick, H. P. (1996a). Synergistic strategies for memory research. In D. J. Herrmann, C. McEvoy, C. Hertzog, P. Hertel & M. K. Johnson (Eds.), Basic and applied memory research: Theory in context (vol. 1)(pp. 51-62). Mahwah, NJ: Lawrence Erlbaum Associates.

Bahrick, H. P. (1996b). The relation between reproductive and reconstructive processing of memory content. Behavioral and Brain Sciences, 19, 191.

Bahrick, H. P. & Phelps, E. (1988). The maintenance of marginal knowledge. In U. Neisser & E. Winograd (Eds.), Remembering Reconsidered: Ecological and Traditional Approaches to the Study of Memory (pp. 178-192). New York: Cambridge University Press.

Baker-Ward, L., Ornstein, P. A. & Gordon, B. N. (1993). A tale of two settings: Young children's memory performance in the laboratory and the field. In G. M. Davies & R. H. Logie (Eds.), Memory in everyday life (pp. 13-41). North-Holland: Elsevier Science Publishers.

Banaji, M. R. & Crowder, R. (1989). The bankruptcy of everyday memory. American Psychologist, 44, 1185-1193.

Banaji, M. R. & Crowder, R. (1991). Some everyday thoughts on ecologically valid methods. American Psychologist, 46, 78-79.

Banaji, M. R. & Crowder, R. (1994). Experimentation and its discontents. In P. E. Morris & M. Gruneberg (Eds.), Theoretical Aspects of Memory (2nd ed.)(pp. 296-308). London: Routledge.

Barker, R. G. (1965). Explorations in ecological psychology. American Psychologist, 20, 1-14.

Barker, R. G. (1968). Ecological Psychology. Stanford, Calif.: Stanford University Press.

Bartlett, F. C. (1932). Remembering. Cambridge: Cambridge University Press.

Bjork, R. A. & Whitten, W. B. (1974). Recency-sensitive retrieval processes in long-term free recall. Cognitive Psychology, 6, 173-189.

Bjork, R. A. & Wickens, T. D. (1996). Memory, metamemory and conditional statistics. Behavioral and Brain Sciences, 19, 193.

Bloom, K. C. & Shuell, T. J. (1981). Effects of massed and distributed practice on the learning and retention of second-language vocabulary. Journal of Educational Research, 74, 245-248.

Brewer, W. F. & Treyers, J. C. (1981). Role of schemata in memory for places. Cognitive Psychology, 13, 207-230.

Bronfenbrenner, U. (1974). Developmental research, public policy, and the ecology of childhood. Child Development, 45, 1-5.

Brooks, P. H. & Baumeister, A. A. (1977). A plea for consideration of ecological validity in the experimental psychology of mental retardation: A guest editorial. American Journal of Mental Deficiency, 81, 407-416.

Brown, J. (1976). An analysis of recognition and recall and of problems in their comparison. In J. Brown (Ed.), Recall and recognition (pp. 1-35). London: Wiley.

Bruce, D. (1985). The how and why of ecological memory. Journal of Experimental Psychology: General, 114, 78-90.

Bruce, D. (1991). Mechanistic and functional explanations of memory. American Psychologist, 46, 46-47.

Bruce, D. (1996). The correspondence metaphor: Prescriptive or descriptive? Behavioral and Brain Sciences, 19, 194-195.

Brunswik, E. (1947). Systematic and Representative design of Psychological Experiment. Berkeley: University of California Press.

Brunswik, E. (1955). Representative design and probabilistic theory in a functional psychology. Psychological Review, 62, 193-217.

Campbell, O. T. & Stanley, J. (1963). Experimental and quasi-experimental designs for research. Palo Alto, London: Mifflin.

Ceci, S. J. (1991). Some overarching issues in the children's suggestibility debate. In J. Doris (Ed.), The suggestibility of children's recollections (pp. 1-9). Washington, DC: American Psychological Association.

Ceci, S. J. (1993). Contextual trends in intellectual development. Developmental Review, 13, 403-435.

Ceci, S. J., & Bronfenbrenner, U. (1991). On the demise of everyday memory. American Psychologist, 46, 27-31.

Chapanis, A. (1967). The relevance of laboratory studies to practical situations. Ergonomics, 10, 557-577.

Cohen, G. (1989). Memory in the Real World. Hillsdale: Lawrence Erlbaum Associates.

Cohen, R. L. (1985). On the generality of the laws of memory. In L. G. Nilsson & T. Archer (Eds.), Perspectives on learning and memory (pp. 247-278). Hillsdale, NJ: LEA.

Conway, M. A. (1991). In defense of everyday memory. American Psychologist, 46, 19-26.

Conway, M. A. (1993). Method and meaning in memory research. In G. M. Davies & R. H. Logie (Eds.), Memory in everyday life (pp. 499-524). North-Holland: Elsevier Science Publishers.

Conway, M. A. (1996). What do memories correspond to? Behavioral and Brain Sciences, 19, 195-196.

Coolican, H. (1992). Research Methods and Statistics in Psychology. London: Hodder.

Cronbach, L. J. (1957). The two disciplines of scientific psychology. American Psychologist, 12, 671-684.

Crowder, R. G. (1993). Faith and Skepticism in memory research. In G. M. Davies & R. H. Logie (Eds.), Memory in everyday life (pp. 525-531). North-Holland: Elsevier Science Publishers.

Davies, G. M. & Logie, R. H. (1993a). Introduction. In G. M. Davies & R. H. Logie (Eds.), Memory in everyday life (pp. 1-12). North-Holland: Elsevier Science Publishers.

Davies, G. M. & Logie, R. H. (Eds.) (1993b), Memory in everyday life. North-Holland: Elsevier Science.

Dewey, J. (1930). Conduct and experience. In C. Murchison (Ed.), Psychologies of 1930. Worcester: Clark University Press.

Dipboye, R. L. & Flanagan, M. F. (1979). Research settings in industrial and organizational psychology: Are findings in the field more generalizable than in the laboratory? American Psychologist, 34, 141-150.

Ebbinghaus, H. E. (1964). Memory: A Contribution to Experimental Psychology. New York: Dover. (Originally published in 1885).

Eysenck, M. W. (Ed.) (1990). The Blackwell Dictionary of Cognitive Psychology. Oxford: Blackwell.

Eysenck, M. W. & Keane, M. T. (2000). Cognitive psychology: A student's handbook (4th ed.). Hove, East Sussex : Psychology Press.

Fabes, R. A., Martin, C. L., Hanish, L. D., & Updergraff, K. A. (2000). Criteria for evaluating the significance of developmental research in the twenty-first century: Force and counterforce. Child Development, 71, 212-221.

Fisher, R. P. (1996). Implications of output-bound measures for laboratory and field research in memory. Behavioral and Brain Sciences, 19, 197.

Gathercole, S. E., & Collins, A. F. (1992). Everyday memory research and its applications. Applied Cognitive Psychology, 6, 461-465.

Gaylord-Ross, R. J. (1979). Mental retardation research, ecological validity, and the delivery of longitudinal programs. Journal of Special Education, 13, 69-80.

Gelfand, H. (1985). The interface between laboratory and naturalistic cognition. In T. M. Shlechter & M. P. Toglia (Eds.), New directions in cognitive science. Norwood, NJ: Ablex Publishing Corp.

Gibbs, J. C. (1979). The meaning of ecologically oriented inquiry in contemporary psychology. American Psychologist, 34, 127-140.

Gibson, J. J. (1979). The ecological approach to visual perception. Boston: Houghton Mifflin.

Gruneberg, M. M. & Morris, P. E. (1992). Applying memory research. In M. Gruneberg & P. Morris (Eds.), Aspects of memory (vol. 1: The practical aspects, 2nd ed.)(pp. 1-17). London: Routledge.

Gruneberg, M. M., Morris, P. E. & Sykes, R. N. (1991). The obituary on everyday memory and its practical applications is premature. American Psychologist, 46, 74-76.

Gump, P. V., & Kounin, J. S. (1960). Issues raised by ecological and classical research efforts. Merrill-Palmer Quarterly of Behavior and Development, 6, 145-152.

Haber, R. N. (1983). The impending demise of the icon. Behavioral and Brain Sciences, 6, 1-54.

Hammond, K. R. (1954). Representative vs. systematic design in clinical psychology. Psychological Bulletin, 51, 150-159.

Hammond, K. R. (1998). Ecological validity: Then and now. Unpublished paper available electronically at <http://brunswik.org/notes/essay2.html>

Harris, J. E. (1984). Remembering to do things: A forgotten topic. In J. E. Harris & P. E. Morris (Eds.), Everyday memory, actions and absent-mindedness (pp. 71-92). London: Academic Press.

Henshel, R. L. (1980). The purposes of laboratory experimentation and the virtues of deliberate artificiality. Journal of Experimental Social Psychology, 16, 466-478.

Herrmann, D. & Gruneberg, M. (1993). The need to expand the horizons of the practical aspects of memory movement. Applied Cognitive psychology, 7, 553-565.

Hilgard, E. R. (1955). Discussion of probabilistic functionalism. Psychological Review, 62, 226-228.

Hintzman, D. L. (1974). Theoretical implications of the spacing effect. In R. L. Solso (Ed.), Theories in cognitive psychology (pp. 77-100). New York : Wiley

Hintzman, D. L. (1993). Twenty-five years of learning and memory: Was the cognitive revolution a mistake? In D. E. Mayer & S. Kornblum (Eds.), Attention and performance XIV (pp. 359-392). London: The MIT Press.

Hirst, W. & Levine, E. (1985). Ecological memory reconsidered: A comment on Bruce's "The how and why of ecological memory". Journal of Experimental Psychology: General, 114, 269-271.

Hoc, J. M. (2001). Towards ecological validity of research in cognitive ergonomics. Theoretical Issues in Ergonomic Sciences, 2, 278-288.

Jost, A. (1897). Die assoziationsfestigkeit in ihrer abhängigkeit von der verteilung der wiederholungen. Zeitschrift für Psychologie, 14, 436-472.

Karuzs, J. Jr., & Zevon, M. A. (1985). Ecological validity and ideography in developmental cognitive science. In T. M. Shlechter & M. P. Toglia (Eds.), New Directions in Cognitive Science. Norwood, NJ: Ablex Publishing Corporation.

Kihlstrom, J. F. (1996). Memory research: The convergence of theory and practice. In D. J. Herrmann, C. McEvoy, C. Hertzog, P. Hertel & M. K. Johnson (Eds.), Basic and applied memory research: Theory in context (vol. 1)(pp. 5-26). Mahwah, NJ: Lawrence Erlbaum Associates.

Klatzky, R. L. (1991). Let's be friends. American Psychologist, 46, 43-45.

Koehler, J. J. (1996). The base rate fallacy reconsidered: descriptive, normative and methodological challenges. Behavioral and Brain Sciences, 19, 1-53.

Koriat, A. & Goldsmith, M. (1994). Memory in naturalistic and laboratory contexts: Distinguishing the accuracy-oriented and quantity-oriented approaches to memory assessment. Journal of Experimental Psychology: General, 123, 297-316.

Koriat, A. & Goldsmith, M. (1996a). memory metaphors and the real-life/laboratory controversy: Correspondence versus storehouse conceptions of memory. Behavioral and Brain Sciences, 19, 167-187.

Koriat, A. & Goldsmith, M. (1996b). The correspondence metaphor of memory: Right, wrong, or useful? Behavioral and Brain Sciences, 19, 211-228.

Krech, D. (1955). Discussion: Theory and reductionism. Psychological Review, 62, 229-231.

Kruglanski, A. W. (1996). The storehouse/correspondence partition in memory research: Promises and perils. Behavioral and Brain Sciences, 19, 198-199.

Kuhn, D. (1978). Mechanisms of cognitive and social development: One psychology or two? Human Development, 21, 92-118.

Kvavilashvili, L. (1992). Remembering intentions: A critical review of existing experimental paradigms. Applied Cognitive Psychology, 6, 507-524.

Kvavilashvili, L. & Ellis, J. (1996). Let's forget the everyday/laboratory controversy. Behavioral and Brain Sciences, 19, 199-200.

Larsen, S. F. (1996). Correspondence to the past: The essence of the archaeology metaphor. Behavioral and Brain Sciences, 19, 200-201.

Lipton, M. (1977). On the psychology of eyewitness testimony. Journal of Applied Psychology, 62, 90-95.

Loftus, E. F. (1993a). Psychologists in the eyewitness world. American Psychologist, 48, 550-552.

Loftus, E. F. (1993b). The reality of repressed memories. American Psychologist, 48, 518-537.

Loftus, E. F. & Ceci, S. J. (1991). Research findings: What do they mean? In J. Doris (Ed.), The suggestibility of children's recollections (pp. 129-133). Washington, DC: American Psychological Association.

Mandler, G. (2003). The future lies before (and behind) us. Unpublished manuscript.

Mandler, G., Pearlstone, Z., & Koopmans, H. S. (1969). Effects of organization and semantic similarity on recall and recognition. Journal of Verbal Learning and Verbal Behavior, 8, 410-423.

- McCall, R. B. (1977). Challenges to a science of developmental psychology. Child Development, 48, 333-344.
- McGuire, W. J. (1969). Theory-oriented research in natural settings: The best of both worlds for social psychology. In M. Sherif & C. Sherif (Eds.), Interdisciplinary relationships in the social sciences (pp.) Chicago: Aldine.
- McGuire, W. L. (1973). The yin and yang of social psychology: Seven Koan. Journal of Personality and Social Psychology, 26, 446-456.
- McNamara, T. P. (1996). False dichotomies and dead metaphors. Behavioral and Brain Sciences, 19, 203.
- Miller, D. B. (1977). Roles of naturalistic observation in comparative psychology. American Psychologist, 32, 211-219.
- Mook, D. G. (1983). In defense of external invalidity. American Psychologist, 38, 379-387.
- Mook, D. G. (1989). The myth of external validity. In L. W. Poon, D. C. Rubin & B. A. Wilson (Eds.), Everyday cognition in adulthood and late life (pp. 25-43). New York: Cambridge Univ. Press.
- Morris, P. E. & Conway, M. A. (Eds.) (1993), The psychology of memory (vol. 3). Aldershot, England: Edward Elgar Publishing.
- Neisser, U. (1976). Cognition and reality. San Francisco: Freeman.
- Neisser, U. (1978). Memory: What are the important questions? In M. M. Gruneberg, P. E. Morris, & R. N. Sykes (Eds.), Practical aspects of memory. New York: Academic Press.
- Neisser, U. (1985a). The role of theory in the ecological study of memory. Journal of Experimental Psychology: General, 114, 272-276.
- Neisser, U. (1985b). Toward an ecologically oriented cognitive science. In T. M. Shlechter & M. P. Toglia (Eds.), New directions in cognitive science (pp. 17-32). Norwood, New Jersey: Ablex.

Neisser, U. (1988a). New vistas in the study of memory. In U. Neisser & E. Winograd (Eds.), Remembering reconsidered (pp. 1-10). Cambridge: Cambridge University Press.

Neisser, U. (1988b). Time present and time past. In M. M. Gruneberg, P. E. Morris, & R. N. Sykes (Eds.), Practical aspects of memory: Current research and issues (vol. 2) (pp. 545-560). Chichester: Wiley.

Neisser, U. (1988c). What is ordinary memory the memory of? In U. Neisser & E. Winograd (Eds.), Remembering reconsidered (pp. 356-373). Cambridge: Cambridge University Press.

Neisser, U. (1991). A case of misplaced nostalgia. American psychologist, 46, 34-36.

Neisser, U. (1996). Remembering as doing. Behavioral and Brain Sciences, 19, 203-204.

Nelson, T. (1978). Detecting small amounts of information in memory: Savings for non-recognized items. Journal of Experimental Psychology: Human Learning and Memory, 4, 453-468.

Newby, I. R. & Ross, M. (1996). Beyond the correspondence metaphor: When accuracy cannot be assessed. Behavioral and Brain Sciences, 19, 205-206.

Parke, R. D. (1976). Social cues, social control, and ecological validity. Merrill-Palmer Quarterly, 22, 111-123.

Parrot, W. G. & Sabini, J. (1990). Mood and memory under natural conditions: Evidence for mood incongruent recall. Journal of Personality and Social Psychology, 59, 321-336.

Pate, J. L. (1986). On Bartlett's criticisms of Ebbinghaus. Revista de Historia de la Psicología, 7, 55-58.

Payne, D. & Conrad, F. (Eds.)(1997). Intersections in basic and applied memory research. Hillsdale, NJ: Lawrence Erlbaum Associates.

Petrinovich, L. (1989). Representative design and the quality of generalization. In L. W. Poon, D. C. Rubin & B. A. Wilson (Eds.), Everyday cognition in adulthood and late life (pp. 11-24). New York: Cambridge University Press.

Poon, L. W. (1993). The maze in the garden. In G. M. Davies & R. H. Logie (Eds.), Memory in everyday life (pp. 439-446). North-Holland: Elsevier Science Publishers.

Poon, L. W., Welke, D. J. & Dudley, W. N. (1993). What is everyday cognition? In J. M. Puckett & H. W. Reese (Eds.), Mechanisms of everyday cognition (pp. 19-32). Hillsdale, NJ: LEA

Postman, L. (1955). The probability approach and nomothetic theory. Psychological Review, 62, 218-225.

Potter, M. C. (1983). Neisser's challenge. Contemporary Psychology, 28, 272-274.

Proshansky, H. M. (1976). Environmental psychology and the real world. American Psychologist, 31, 303-310.

Puckett, J. M. & Reese, H. W. (Eds.)(1993). Mechanisms of everyday cognition. Hillsdale, NJ: LEA

Puckett, J. M., Reese, H. W. & Pollina, L. K. (1993). An integration of life-span research in everyday cognition. In J. M. Puckett & H. W. Reese (Eds.), Mechanisms of everyday cognition (pp. 3-16). Hillsdale, NJ: LEA

Puckett, J. M., Pollina, L. K., Laipple, J. S., Tunick, R. H. & Jurden, F. H. (1993). A survey of research in everyday cognition: Ten views. In J. M. Puckett & H. W. Reese (Eds.), Mechanisms of everyday cognition (pp. 231-244). Hillsdale, NJ: LEA

Rea, C. P. & Modigliani, V. (1985). The effect of expanded versus massed practice on the retention of multiplication facts and spelling lists. Human learning: Journal of Practical Research and Applications, 4, 11-18.

Roediger, H. L. (1991). They read an article? American Psychologist, 46, 37-40.

Roediger, H. L. & Crowder, R. G. (1976). A serial position effect in recall of United States Presidents. Bulletin of the Psychonomic Society, 8, 275-278.

Roediger, H. L. & McDermott, K. B. (1995). Creating false memories: remembering words not presented in lists. Journal of Experimental Psychology: Learning, Memory, and Cognition, 21, 803-814.

Rubin, D. C. (1989). The how, when, and why of studying everyday cognition. In L. W. Poon, D. C. Rubin & B. A. Wilson (Eds.), Everyday cognition in adulthood and late life (pp. 3-10). New York: Cambridge University Press.

Sbordone, R. J., & Long, C. J. (Eds.) (1996). Ecological validity of neuropsychological testing. Delray Beach, FL: GR Press/St. Lucie Press, Inc.

Sbordone, R.J., & Guilmette, T. J. (1999). Prediction of everyday and vocational functioning from neuropsychological test data. In J.J. Sweet (Ed.), Forensic neuropsychology: Fundamentals and practice (pp. 227-254). Bristol, PA: Swets & Zeitlinger Publishers.

Schmuckler, M. A. (2001). What is ecological validity? A dimensional analysis. Infancy, 2, 419-436.

Silver, C. H. (2000). Ecological validity of neuropsychological assessment in childhood traumatic brain injury. Journal of Head Trauma Rehabilitation, 15, 973-988.

Sinnott, J. D. & West, R. L. (1992). Preface: How this book came to be and what you can expect to find here. In R. L. West & J. D. Sinnott (Eds.), Everyday memory and Aging (pp. v-xii). New York: Springer-Verlag.

Slamecka, N. J. (1985). Ebbinghaus: Some associations. Journal of Experimental Psychology: Learning, Memory and Cognition, 11, 414-435.

Smith, S. M. & Rothkopf, E. Z. (1984). Contextual enhancement and distribution of practice in the classroom. Cognition and Instruction, 1, 341-358.

Tulving, E. (1991). Memory research is not a zero-sum game. American Psychologist, 46, 41-42.

Tunnell, G. B. (1977). Three dimensions of naturalness: An expanded definition of field research. Psychological Bulletin, 84, 426-437.

Tzeng, O. J. L. (1973). Positive recency effect in delayed free recall. Journal of Verbal Learning & Verbal Behavior, 12, 436-439.

Weisz, J. R. (1978). Transcontextual validity in developmental research. Child Development, 49, 1-12.

Willems, E. P. (1965). An ecological orientation in psychology. Merrill-Palmer Quarterly, 11, 317-343.

Willems, E. P., & Raush, H. L. (Eds.) (1969). Naturalistic Viewpoints in Psychological Research. New York: Holt.

Winograd, E. (1988). Continuities between ecological and laboratory approaches to memory. In U. Neisser, & E. Winograd (Eds.), Remembering Reconsidered (pp. 11-20). Cambridge: Cambridge University Press.

Winograd, E. (1991). The case for both approaches to memory. Paper presented at the International Conference on Memory, Lancaster, July.

Winograd, E. (1993). Memory in the laboratory and everyday memory: The case for both. In J. M. Puckett & H. W. Reese (Eds.), Mechanisms of everyday cognition (pp. 55-72). Hillsdale, NJ: LEA

Winograd, E. (1996). Contexts and functions of retrieval. Behavioral and Brain Sciences, 19, 209-210.

Winograd, E., Fivush, R., & Hirst, W. (1999) (Eds.). Ecological approaches to cognition. Mahwah, NJ: Lawrence Erlbaum Associates.

Wright, D. B. (1996). Hypothesis testing in experimental and naturalistic memory research. Behavioral and Brain Sciences, 19, 210-211.

Wright, D. B. (1997). Methodological issues for naturalistic event memory research. In D. Payne & F. Conrad (Eds.), Intersections in basic and applied memory research (pp. 69-86). Hillsdale, NJ: Lawrence Erlbaum Associates.

Wright, D. B. & McDaid, A. T. (1996). Comparing system and estimator variables using data from real line-ups. Applied Cognitive Psychology, 10, 75-84.

Yuille, J. C. (1993). We must study forensic eyewitnesses to know about them. American Psychologist, 48, 572-573.

Yuille, J. C. & Wells, G. L. (1991). Concerns about the application of research findings: The issue of ecological validity. In J. Doris (Ed.), The suggestibility of

children's recollections (pp. 118-128). Washington, DC: American Psychological Association.

Zacks, R. T. & Hasher, L. (1992). Memory in life, lab, and clinic: Implications for memory theory. In D. J. Herrmann, H. Weingartner, A. Searleman & C. McEvoy (Eds.), Memory improvement: Implications for memory theory (pp. 232-246). New York: Springer-Verlag.

¹ According to some authors (see Baddeley, 1989) it even started in 1880s when Ebbinghaus in Germany and Sir Francis Galton in England approached the scientific study of memory from radically different standpoints.

² The term ‘ecological validity’ has changed markedly over time and now bears little resemblance to its original usage by Brunswik (see, for example, Hammond, 1998; Petrinovitch, 1989; Poon et al., 1993). Some psychologists, therefore, prefer to speak of external rather than ecological validity (Mook, 1983;1989; Slamecka, 1985). The latter, however, is more commonly used and widely accepted term in the current debate and thus is employed in this paper (for a discussion on transformations that the original concepts may sometimes undergo after their inception, see Conway, 1991).

³ It is interesting to note that not only traditionally oriented psychologists became the "victims" of these misconceptions but also some of the proponents of ecological approach itself (see e.g., Cohen, 1989; Conway, 1993 ; Hirst & Levine, 1985).

⁴ Although, it should be noted here that Neisser himself is of different opinion (see Neisser, 1996). According to him, the crucial difference between his and Banaji and Crowder’s views “does not concern how research should be controlled or where it should be conducted; it concerns how we think about memory” (p.203) (cf. Koriatic & Goldsmith, 1996a).

⁵ In fact, there are only very few psychologists who have publicly espoused an opposing viewpoint (see, e.g., Henshel, 1980; Mook, 1983).

⁶ Further examples include the long-term recency effect that has been established with both unrepresentative (Bjork and Whitten, 1974; Tzeng, 1973) and representative (Baddeley and Hitch, 1977; Roediger and Crowder, 1976) material, and the creation of

false memories not only with highly representative materials inside and outside the laboratory (see Brewer & Treyers, 1981; Loftus, 1993b) but also with a traditional list learning paradigm (e.g., Roediger & McDermot, 1995). For additional examples see Bjork and Wickens, 1996.

⁷ It is, of course, obvious that everyday memory studies are sometimes forced to sacrifice certain amount of control, especially at the acquisition phase, in order to be able to study the phenomenon of interest such as, for example, autobiographical memory (for an interesting discussion on methodological problems encountered by everyday memory researchers, see Wright, 1997). However, the proponents of ecological approach are well aware of this shortcoming and, as a result, they try to invent some compensatory strategies and methods to overcome this problem. For example, Rubin (1989) has stressed the importance of revealing regularities in successive replications of everyday memory studies and Bahrck (1989) has used extensively the multiple-regression techniques in combination with a cross-sectional design and archival data (see also Wright & McDaid, 1996).

⁸ In relation to this it is perhaps worth noting that according to McNamara (1996) “Koriat & Goldsmith’s results do not bode well for the everyday memory movement, inasmuch as findings thought to be unique to natural, social contexts of remembering can also be replicated in a sterile laboratory, using a “banal” task of memorizing a list of unrelated words” (p. 203).

⁹ Lists of digits or unrelated words, for example, have often been replaced or supplemented by more naturalistic materials such as pictures, stories, films, etc. Moreover, the popular topics in current laboratory research “include implicit memory, mental imagery, motor skills, story schemata, social scripts, object recognition, and

cognitive maps – which...[are] appreciably closer... to the sorts of things people do everyday” (p. 35; Neisser, 1991).

¹⁰ For example, psychologists conducting everyday memory research are often guided by the theoretical constructs borrowed from traditional approach (see Winograd, 1993) whereas ecological approach has enriched the entire field of memory research with a variety of new techniques and methods which were not used previously (e.g., questionnaire and diary methods, field experiments, etc.).